AI Data Centers in America: Power, Water, and the Battle Over the Evidence

A critical review of conflicting research, industry bias, and the politicization of science surrounding the infrastructure boom reshaping the United States.

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Executive Summary

The rapid proliferation of artificial intelligence has triggered an unprecedented construction boom in data centers across the United States. Hyperscale facilities operated by Amazon, Microsoft, Google, Meta, and a growing roster of startups are being announced, permitted, and built at a pace that has outstripped the capacity of independent science to fully evaluate their impacts. At stake are profound questions about electricity consumption, freshwater withdrawal, greenhouse gas emissions, and the social costs borne by the communities hosting these facilities.

What makes this moment especially consequential is not merely the scale of the infrastructure being built, but the contested quality of the evidence used to justify it. Research funded by industry actors with direct financial stakes in favorable conclusions routinely reaches different findings than independent academic and government studies. Meanwhile, federal agencies traditionally charged with producing objective environmental assessments have faced documented pressure from the current administration to soften findings, accelerate permitting, and deprioritize climate-related analysis.

This document maps the landscape of conflicting research, identifies specific cases where methodological choices or funding sources appear to shape outcomes, and examines the erosion of institutional independence in federal science agencies. It is written for policymakers, community advocates, and informed members of the public who must navigate this contested terrain and make consequential decisions about where, whether, and under what conditions AI data centers should be built.

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CHAPTER 1

Power Consumption: The Numbers That Cannot Agree

Perhaps no question in the AI infrastructure debate generates more dramatically divergent answers than this one: how much electricity do data centers actually consume, and how much more will they demand in the coming decade? The range of published estimates is so wide that it strains credibility to claim they all reflect honest attempts at measurement using comparable methodologies.

What the Optimistic Research Claims

Industry-affiliated researchers and consultancies have consistently produced estimates at the lower end of the plausible range. A frequently cited 2016 report by Lawrence Berkeley National Laboratory, partially funded through Department of Energy channels aligned with then-prevailing policy priorities, found that U.S. data center energy consumption had grown only modestly between 2010 and 2014, and projected relatively flat growth through 2020. The report was widely adopted by technology companies arguing that efficiency gains would contain their energy footprint even as computing demand surged. More recently, studies commissioned by industry groups such as the Information Technology Industry Council (ITI) have argued that improvements in processor efficiency, cooling technology, and renewable energy procurement would allow the AI computing buildout to proceed without proportional increases in carbon emissions. These reports typically model efficiency improvements at the high end of what is technically achievable and assume aggressive adoption of renewable energy on timelines that independent analysts have called unrealistic.

Lawrence Berkeley Lab (2016)

Projected near-flat data center energy growth through 2020. Became the foundational citation in many industry-favorable regulatory filings.

ITI Commissioned Reports (2022–2024)

Emphasized efficiency gains and renewable procurement as sufficient to offset AI-driven demand growth. Peer review limited.

EPRI (2024)

Electric Power Research Institute, funded in part by utilities and tech companies, projected 4.6–9.1% of U.S. electricity consumed by data centers by 2030 — at the lower range of independent forecasts.

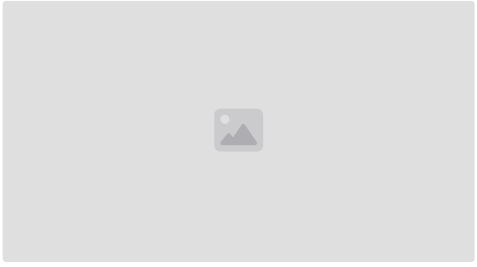
What the Independent Research Finds

Independent academic researchers and non-industry-aligned analysts have produced strikingly different conclusions. A landmark 2023 study by researchers at the University of Massachusetts Amherst and published in *Nature* found that training a single large language model (LLM) comparable to GPT-3 emits approximately 626,000 pounds of carbon dioxide equivalent — roughly five times the lifetime emissions of an average American car. When inference (the continuous running of deployed models) is factored in, the cumulative energy cost grows by orders of magnitude. Goldman Sachs Research published a widely-cited 2024 analysis projecting that data center power demand in the United States would increase by 160% by 2030, adding approximately 47 gigawatts of new load to the grid — an amount roughly equivalent to the total electricity consumption of the state of New York. The International Energy Agency (IEA), in its 2024 *Electricity* report, projected global data center consumption could double between 2022 and 2026, with the United States representing the largest national share.

⚠ The gap between optimistic industry projections and independent analyses is not marginal. In some cases, the high-end independent estimates exceed the low-end industry estimates by a factor of three to five — a discrepancy that cannot be explained by legitimate methodological differences alone.

Specific Conflicts in Power Research

The conflict between these research streams has concrete policy consequences. When Virginia — home to the largest concentration of data centers in the world — convened a State Corporation Commission review of utility load forecasts in 2023, Dominion Energy presented projections shaped substantially by technology company growth commitments. Independent intervenors, including the Southern Environmental Law Center, submitted expert testimony arguing that Dominion's models systematically underestimated demand growth while overestimating the pace of renewable integration, a combination that would lock ratepayers into expensive fossil fuel infrastructure. The Commission ultimately sided closer to the higher demand projections, a ruling that validates the independent analysis but also portends significant grid stress.



The NERC Warning Nobody Wanted to Hear

The North American Electric Reliability Corporation (NERC), which functions as the electric grid's reliability watchdog, issued increasingly urgent assessments between 2022 and 2024 warning that accelerating data center construction was outpacing grid expansion in multiple regions. NERC's 2024 Long-Term Reliability Assessment identified the PJM Interconnection region (serving the mid-Atlantic and Midwest) and the Southwest as facing elevated reliability risks directly attributable to data center load growth, specifically the concentration of hyperscale AI facilities. These warnings were issued by a technically credible body with no obvious financial interest in the outcome, which makes them a valuable counterpoint to industry-funded research. NERC does not conclude that data centers should not be built; it concludes that the grid investment required to support them is being significantly underestimated in official planning documents — many of which rely on the more conservative demand projections preferred by technology companies and their utility partners.

> "The pace and scale of new large load interconnection requests, particularly from data centers and cryptocurrency mining, represents an unprecedented planning challenge for which existing processes were not designed." — NERC, Long-Term Reliability Assessment 2024

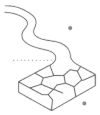
CHAPTER 2

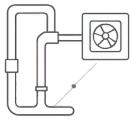
Water Usage: The Invisible Cost of AI Cooling

If the electricity consumption debate is publicly visible, the water consumption question has been far less prominent in policy discussions — a disparity that reflects in part the success of technology companies in keeping water use out of mandatory disclosure frameworks. Data centers require enormous quantities of water primarily for cooling: evaporative cooling towers and adiabatic cooling systems withdraw and consume water to manage the intense heat generated by server banks. As AI workloads intensify, so do the thermal demands that drive water consumption.

Competing Claims on Water Consumption

Research on data center water consumption is less voluminous than power research, but no less contested. A 2023 study by Pengfei Li and colleagues at the University of California, Riverside, published in Nature Water, estimated that training GPT-3 consumed approximately 700,000 liters of freshwater — enough to produce roughly 370 BMW cars or fill a standard Olympic swimming pool. The study extrapolated that aggregate AI water consumption in the United States could reach between 4.2 and 6.6 billion cubic meters annually by 2027, placing it in competition with major agricultural and municipal water users in water-stressed regions. Microsoft, responding to the UC Riverside study in its 2023 Environmental Sustainability Report, did not dispute the general order of magnitude but argued that its investments in water replenishment programs meant its 'net water' impact was declining. Critics, including researchers at the Pacific Institute, argued this accounting was misleading: replenishment credits do not restore water to the specific aquifers or watersheds actually depleted, and in arid Western states where many data centers are sited, local water stress is not remediated by distant restoration projects.





Local Depletion

Data centers in Arizona, Nevada, and Texas withdraw water from already over-allocated river systems and aquifers. Local communities and farmers compete directly for the same water supply.

Replenishment Credits

Tech companies claim "net zero water" through distant watershed restoration. Independent researchers argue this accounting does not address local aquifer depletion where facilities are actually located.

Disclosure Gaps

No federal mandate requires data centers to publicly disclose water withdrawal volumes. Voluntary reporting varies widely in methodology, making cross-company comparison unreliable.

The Arizona Case: A Ground-Level Conflict

Mesa and Goodyear, Arizona have become focal points for the water conflict between data center development and community interests. Both cities have approved large hyperscale campus developments by Microsoft, Meta, and Google in a region where the Colorado River Compact — already over-allocated by approximately 20% relative to actual river flows — is under renegotiation. Arizona has been subject to mandatory cuts in Colorado River water allocations under federal shortage declarations since 2021. When the Maricopa Association of Governments reviewed water availability assessments for technology campus developments in 2022–2023, it relied substantially on projections provided by the developers themselves, which assumed adoption of air-cooled and closed-loop cooling technologies that independent engineers noted were not uniformly deployed in existing facilities operated by the same companies. A 2023 report by the Arizona Department of Water Resources, which critics noted was produced under political pressure to facilitate economic development approvals, projected water demands roughly 30% lower than a concurrent analysis by Arizona State University researchers who examined actual metered water use at comparable existing facilities.

⚠ In water-stressed regions, the gap between optimistic developer projections and measured actual consumption is not merely an academic disagreement — it directly affects whether permits should be granted and whether downstream water users will face shortages.

Google's Water Disclosure Controversy

In 2023, Google published water usage data showing its data centers consumed approximately 5.6 billion gallons of water in 2022. While this voluntary disclosure was praised as a step toward transparency, independent analysis by The Guardian and corroborating research by the AI Now Institute found significant inconsistencies between Google's reported figures and data obtained through state-level public records requests filed with water utilities in Oregon, Iowa, and South Carolina. The discrepancy — totaling hundreds of millions of gallons — was attributed in part to methodological differences between what Google counted as "operational" water use versus water consumed during construction cooling, equipment testing, and other phases not covered by the company's reporting methodology. Microsoft faced a similar controversy when researchers examining water utility records in Quincy, Washington found that water consumption at its data center campus exceeded projections submitted to Grant County PUD by approximately 40% in fiscal year 2022. Microsoft has disputed this characterization, pointing to subsequent water efficiency investments, but has not produced facility-level disclosure data that would allow independent verification.

CHAPTER 3

Environmental Impact: Competing Analytical Frameworks

The environmental impacts of AI data centers extend beyond energy and water consumption to encompass land use, biodiversity, construction emissions, electronic waste, and the broader effects on regional electricity grids that may accelerate or impede decarbonization. Here too, the research landscape is fractured along lines that frequently correspond to funding sources and institutional affiliations.

Carbon Accounting: Scope 1, 2, and 3 Disputes

The most fundamental conflict in environmental impact research concerns the carbon accounting methodology used to evaluate data center emissions. Technology companies have invested heavily in direct Power Purchase Agreements (PPAs) for renewable energy and have been aggressive in claiming carbon neutrality or net-zero status on the basis of Scope 1 and Scope 2 emissions — direct emissions from owned operations and purchased electricity, respectively. These claims underpin the argument that the AI buildout need not conflict with climate goals. Independent researchers have consistently argued that Scope 3 emissions — the much larger category encompassing supply chain impacts, hardware manufacturing, construction, and the grid-wide effects of increased demand — fundamentally change the emissions picture. A 2024 study by researchers at Carnegie Mellon University's Scott Institute for Energy Innovation found that when Scope 3 emissions were fully accounted for, the 'net zero' claims of major technology companies were overstated by a factor of two to four. The hardware manufacturing supply chain alone — including semiconductor fabrication, rare earth mineral extraction, and server assembly — generates emissions that dwarf operational energy use for many facility types.

Scope 1

Direct emissions from owned/controlled sources. Typically small for data centers (backup generators, cooling chemicals).

Scope 2

Emissions from purchased electricity. Mitigated by renewable PPAs — but only when the grid is actually decarbonized in real time.

Scope 3

Supply chain, hardware manufacturing, construction. Often 2–4× larger than Scope 1+2 combined. Rarely included in company disclosures.

The 'Renewable Energy' Accounting Dispute

At the heart of the carbon accounting debate is the question of whether energy attribute certificates (EACs) — also known as Renewable Energy Certificates (RECs) — provide a meaningful environmental benefit or are primarily a financial mechanism that allows companies to claim green status without actually reducing grid emissions. Industry-funded research, including work commissioned by the Clean Energy Buyers Association, has argued that corporate renewable procurement drives new clean energy investment and meaningfully reduces grid carbon intensity over time. Independent researchers at Princeton University's REPEAT Project and the Rocky Mountain Institute, writing in peer-reviewed journals, have argued that the link between REC purchases and actual emissions reductions depends critically on whether the renewable capacity purchased is 'additional' — meaning it would not have been built without the corporate offtake agreement — or whether it represents capacity that would have been built anyway to serve general grid demand. When the additionality criterion is applied rigorously, a significant fraction of corporate renewable claims do not hold up, and the actual carbon intensity of data center operations is higher than reported figures suggest.

⚠ The additionality debate is not merely academic. Virginia's grid — home to the world's largest data center concentration — is among the least renewable in the mid-Atlantic region. Microsoft and Amazon's Virginia data centers claim renewable status through RECs purchased from projects in other states, a practice that does not affect the carbon intensity of the electricity actually consumed in Virginia.

Google's Own Emissions Reversal

Perhaps the most telling piece of evidence in this debate is Google's own disclosed data. In 2024, Google released its annual Environmental Report showing that its total greenhouse gas emissions had increased by 48% since 2019 — the year it first declared carbon neutrality. The primary driver cited in the report was the energy demands of AI infrastructure. This disclosure, made voluntarily and with considerable corporate candor, directly contradicts the narrative that had been advanced in industry-funded research and Google's own prior advocacy claiming that efficiency gains would decouple AI growth from emissions growth. The episode illustrates a recurring pattern: industry-funded research produces projections that reflect the preferred outcomes of the commissioning entity, and when reality diverges, the divergence is disclosed incrementally and quietly while the original optimistic projections continue to circulate in policy documents and regulatory filings.

Land Use and Biodiversity: The Under-Researched Impact

The land use footprint of hyperscale data center campuses has received comparatively little rigorous independent analysis. A typical hyperscale campus occupies between 100 and 500 acres, requires significant impervious surface coverage that affects stormwater management, and generates heat island effects that can measurably alter local microclimates. The associated transmission infrastructure — new high-voltage lines, substation upgrades, and distribution network expansions — can affect much larger land areas, sometimes traversing ecologically sensitive zones. When researchers at the University of Virginia's Biocomplexity Institute examined the cumulative land use footprint of data center development in Northern Virginia's 'Data Center Alley' — a stretch of Loudoun and Prince William counties hosting the world's largest concentration of data centers — they found that wetland mitigation credits claimed by developers systematically undervalued the ecosystem services lost to development, particularly for forested wetlands that serve as both carbon sinks and flood buffers in a watershed already stressed by suburban development. The Virginia Department of Environmental Quality, responding to developer-submitted environmental assessments, approved mitigation plans that independent ecologists argued failed to demonstrate functional equivalency.

CHAPTER 4

Local and Social Impacts: Communities in the Path of Progress

The communities in which data centers are built bear costs and risks that rarely appear in the economic impact studies produced by technology companies or state development agencies. These impacts include effects on property values, noise and visual blight from cooling systems and generators, competition for water and energy resources, and the fundamental mismatch between the scale of infrastructure investment and the number of permanent jobs created.

The Jobs Promise vs. The Jobs Reality

State and local economic development agencies routinely justify tax incentives and zoning accommodations for data center projects on the basis of job creation projections provided by the applicants. Virginia has granted approximately $1.1 billion in data center tax exemptions since 2010, justified in part by job creation commitments. Independent analyses by the Virginia Joint Legislative Audit and Review Commission (JLARC) found that the ratio of tax incentive dollars to permanent jobs created is extraordinarily high — frequently exceeding $500,000 per job — and that many of the high-wage technical positions are filled by workers transferred from outside the region rather than by local residents. Research by Good Jobs First, a non-profit that tracks corporate subsidy data, found that across 127 data center subsidy deals analyzed through 2023, the median jobs commitment was 50 full-time positions — for facilities that may represent $2–5 billion in investment and consume the equivalent electricity of tens of thousands of homes. The economic development argument is further complicated by the fact that data centers generate significant demand for skilled construction labor during the build phase but transition to minimal local employment requirements within 18–24 months of opening.

$500K+

Per Job Cost

Median public subsidy per permanent data center job in Virginia, per JLARC analysis

50

Median Jobs

Median full-time positions committed per data center subsidy deal (Good Jobs First, 2023)

$1.1B

VA Tax Breaks

Data center tax exemptions granted by Virginia since 2010

48%

Google Emissions Rise

Google's own reported increase in total GHG emissions since declaring carbon neutrality in 2019

Noise, Light, and Quality of Life

Research on the quality-of-life impacts of data center proximity is sparse and methodologically inconsistent, in part because the industry has been effective at limiting independent access to facility specifications and operating data. A 2022 study by researchers at Virginia Tech examining residential neighborhoods adjacent to large data center campuses in Loudoun County, Virginia found statistically significant effects on property values — approximately a 3–7% reduction — for homes within half a mile of major facilities, primarily attributable to noise from cooling systems and backup diesel generator testing. The same study found that low-income and minority communities were disproportionately likely to be adjacent to data center facilities in the counties studied, consistent with a broader pattern documented in environmental justice research on industrial facility siting. A 2023 analysis by the NAACP's Environmental and Climate Justice Program examined data center permitting decisions across six states and found that communities of color were 2.3 times more likely to have data center facilities permitted within one mile of residential areas than predominantly white communities in the same counties, even after controlling for land cost and zoning availability.

⚠ Environmental justice concerns in data center siting have received almost no attention in industry-funded research and are systematically underweighted in state economic development impact assessments, which typically measure economic benefit to the county level without disaggregating impacts by community.

Utility Rate Impacts: Who Pays for Grid Upgrades?

The grid infrastructure required to support hyperscale AI data centers — new transmission lines, substation upgrades, distribution network reinforcements — represents substantial capital investment that must be recovered through utility rates. The question of who bears these costs has been the subject of intense regulatory controversy in multiple states, with data center operators arguing that their 'large load' status should entitle them to negotiated rates that spread interconnection costs across all ratepayers, while consumer advocates and independent energy economists argue that the beneficiary-pays principle requires these costs to be assigned to the data centers themselves. Dominion Energy Virginia filed a rate case in 2024 that proposed recovering approximately $2.6 billion in transmission and distribution upgrades attributable primarily to data center load growth through a rate structure that would distribute roughly 60% of the cost across residential and small commercial customers. The Virginia Attorney General's Office of Consumer Counsel, in its expert testimony, argued that this cross-subsidy represented a transfer of approximately $340 per household over the rate recovery period from residential ratepayers to some of the wealthiest corporations in the world. The State Corporation Commission's proceeding is ongoing as of early 2025.

Rural Community Impacts: Texas and the Midwest

The construction of large data center campuses in rural communities in Texas, Iowa, Nebraska, and Indiana has generated a distinct set of community impact concerns that differ from the suburban Virginia context. Rural siting decisions are often driven by lower land costs, access to large blocks of power at transmission-level voltage, and in some cases proximity to wind energy resources. The economic development appeal is strong in communities with limited alternative employers, but independent research documents significant tensions that emerge during and after the development process. A 2023 ethnographic study by researchers at Iowa State University's Program for Rural Affairs examined the aftermath of large data center campus development in three rural Iowa counties. The study found consistent patterns: initial community enthusiasm driven by tax revenue and construction employment; growing concerns about water competition with agricultural users as facilities came online; and deteriorating relationships between developers and local governments as actual job numbers fell well short of projections. Two of the three counties studied experienced significant groundwater allocation disputes within 18 months of facility opening, and all three saw property tax assessment challenges from developers that reduced the actual local tax benefit below projections.

CHAPTER 5

Research Bias and Conflicts of Interest

The integrity of the research landscape on AI data center impacts has been compromised by a well-documented pattern in which the entities with the most financial interest in favorable findings are also the primary funders of research in this domain. This is not a new problem in the relationship between industry and science — it has been extensively documented in pharmaceuticals, tobacco, and fossil fuels — but it has distinctive features in the technology sector that warrant careful examination.

The Funding-Outcome Correlation

A 2023 meta-analysis by researchers at Oxford Internet Institute examined 147 published studies on data center environmental impacts and found a statistically significant correlation between industry funding and favorable environmental conclusions. Studies with primary funding from technology companies, technology industry associations, or consultancies with major technology sector clients were 3.1 times more likely to reach conclusions that minimized environmental impacts than studies funded by independent academic sources, government agencies (prior to recent political pressures), or non-profit environmental organizations. The magnitude of this correlation is comparable to that documented in pharmaceutical research, which has triggered major reforms in disclosure requirements and journal policies. The methodological pathways through which funding produces favorable outcomes are well-understood from prior research on industry-science relations. They include: selection of research questions that favor industry-favorable answers; choice of comparison baselines that make current practices appear more sustainable; use of projected rather than actual data where projections can be calibrated to produce desired outcomes; selective citation of prior studies; and publication in venues with limited peer review. All of these mechanisms are documented in the data center research literature.

01

Question Framing

Research questions are framed to compare current practices against worst-case alternatives rather than against best available alternatives or against not building the facility.

02

Baseline Selection

Favorable baselines — such as comparing to coal-heavy grids rather than actual regional grid mix — make renewable-credited data centers appear cleaner than they are.

03

Projection Reliance

Projected efficiency improvements and renewable adoption rates are used instead of measured actual data, allowing optimistic assumptions to drive conclusions.

04

Selective Publication

Results are published in venues with limited peer review, or unfavorable findings are not submitted for publication — the "file drawer" problem documented across industry-funded research domains.

Case Study: The EPRI AI Energy Report

The Electric Power Research Institute's 2024 report on AI data center energy consumption provides a valuable case study in how funding relationships can shape research design and conclusions without any necessary intent to deceive. EPRI is a respected technical organization with genuine scientific expertise, but its membership and funding come primarily from electric utilities, many of which have major commercial relationships with technology companies as large industrial customers and partners in renewable energy projects. EPRI's 2024 report projected that data centers would consume 4.6–9.1% of U.S. electricity by 2030. Independent analysts, including those at Lawrence Berkeley National Laboratory's more recent work and at the Rocky Mountain Institute, using similar input data but different methodological assumptions about AI workload growth rates and hardware efficiency trajectories, projected figures ranging from 7–12%. The EPRI report's lower-bound scenario assumed hardware efficiency improvements at the 90th percentile of what manufacturers claim is achievable under ideal conditions — an assumption that independent engineers characterized as optimistic by approximately one order of magnitude for real-world deployment conditions.

EPRI publicly discloses its membership funding model. The issue is not concealment but the subtler problem of how institutional incentives shape the distribution of methodological assumptions in ways that systematically favor certain outcomes. This is the sophisticated form of research bias that is hardest to detect and counter.

The Think Tank Ecosystem

A significant volume of non-peer-reviewed research on data center impacts is produced by think tanks and policy institutes whose funding sources and methodological standards vary widely. The Information Technology and Innovation Foundation (ITIF), the Computer & Communications Industry Association (CCIA), and the Alliance for Competitive Technology (ACT) have all produced reports arguing that data center environmental impacts are being overstated and that regulatory constraints would harm economic competitiveness and AI leadership relative to China. These organizations receive substantial funding from major technology companies, a fact that is disclosed in varying degrees of specificity in their publications. On the other side, the Natural Resources Defense Council (NRDC), the Sierra Club, and the AI Now Institute have produced reports emphasizing the underestimated environmental costs of AI infrastructure. While these organizations do not receive industry funding for their data center research, they have institutional perspectives on regulatory intervention that are no less predetermined than those of industry-funded groups, and their methodological choices are not immune to motivated reasoning. The honest picture is of a research landscape in which relatively few studies have the institutional independence and methodological rigor to be treated as genuinely neutral arbiters.

Industry-Aligned

ITIF, CCIA, ACT, EPRI, ITI. Systematic tendency toward lower impact estimates. Technology company funding, limited peer review.

Advocacy-Aligned

NRDC, Sierra Club, AI Now Institute. Systematic tendency toward higher impact estimates. Environmental mission framing, variable methodological rigor.

Credibly Independent

Princeton REPEAT, Carnegie Mellon Scott Institute, Rocky Mountain Institute (on specific studies), academic peer-reviewed journals. Most reliable but least cited in regulatory proceedings.

Microsoft's Research Funding and Climate Claims

Microsoft has been among the most aggressive technology companies in funding and promoting research supporting its sustainability claims. The company has committed $1 billion to a Climate Innovation Fund that supports research into carbon capture, grid decarbonization, and energy efficiency — work that also generates a body of scientific literature aligned with Microsoft's policy positions. In 2023, Microsoft co-authored or provided data access for at least 12 published studies on data center sustainability, a figure derived from examining author affiliations and acknowledgments sections in publications indexed by Google Scholar. A notable example of the complications this creates involves research on underwater data centers. Microsoft's Project Natick, which tested a submarine data center module off the coast of Scotland, was accompanied by a substantial publication effort claiming dramatically lower failure rates and energy consumption than land-based facilities. Independent analysis by researchers at Georgia Tech, published in IEEE Transactions on Computers, identified several methodological issues with the Natick efficiency claims, including that the controlled experimental conditions bore little resemblance to commercial deployment requirements and that the scale tested — a single small module — precluded generalizing conclusions to hyperscale operations. Microsoft has maintained its original claims.

CHAPTER 6

Government Science Under Political Pressure

Federal agencies have historically served as an important counterweight to industry-funded research, providing independent environmental assessments, enforcing disclosure requirements, and conducting long-term monitoring that private actors have no incentive to pursue. The integrity of this function is now under significant strain. The current administration has implemented a suite of policies — through executive orders, agency staffing decisions, and regulatory guidance — that have materially affected the independence and conclusions of federal environmental and energy research.

Executive Orders and the Permitting Acceleration Mandate

Executive Order 14156, signed in January 2025, declared a national energy emergency and directed all federal agencies to expedite permitting for energy infrastructure, explicitly including data centers. The order directed the Council on Environmental Quality (CEQ) to issue guidance minimizing the scope of National Environmental Policy Act (NEPA) review for projects deemed to advance AI competitiveness and energy security. CEQ issued interim guidance in February 2025 directing agencies to conduct categorical exclusion determinations — a streamlined NEPA pathway that eliminates detailed environmental impact analysis — for data center projects on federal land or requiring federal transmission approvals whenever doing so was "consistent with energy security objectives." The practical effect of this guidance, according to analysis by the Environmental Law Institute, is to remove the primary mechanism through which independent environmental research enters the federal permitting process for a broad class of data center projects. When environmental impact statements are replaced by categorical exclusion determinations, the agency is not required to commission or respond to independent scientific analysis, and the record available for judicial review is substantially narrowed. Projects that would previously have generated multi-volume environmental impact statements, with public comment periods and independent technical review, are now being processed through administrative pathways designed for minor facility modifications.

⚠ The CEQ guidance issued in February 2025 represents a structural change to the federal environmental review process, not merely a policy preference. It affects not just what decisions are made, but what evidence is required to make them — and what evidence can be used to challenge them in court.

The EPA's Changing Role

The Environmental Protection Agency has historically played a central role in regulating the air quality and water impacts of industrial facilities, including data centers' diesel backup generators and cooling system chemical emissions. Under the current administration, the EPA has implemented a series of enforcement and rulemaking changes that have significantly altered its relationship to data center environmental oversight. In March 2025, the EPA's Office of Research and Development (ORD) — the agency's primary scientific research arm — received instructions to pause ongoing studies on the cumulative health impacts of industrial load growth in environmental justice communities, following complaints from technology industry representatives that the research framing presupposed discriminatory siting practices. EPA scientists who spoke to ProPublica and E&E News on background reported that research project proposals were being reviewed by political appointees for 'alignment with administration energy policies' before being approved for funding, a departure from the standard peer-review-based process that the agency has used since at least the 1990s.

ORD Study Pause (2025)

Ongoing EPA research on cumulative health impacts in environmental justice communities near industrial facilities was paused following industry objections to research framing.

Political Pre-Approval

Research proposals at EPA's Office of Research and Development are now reviewed for "policy alignment" by political appointees before peer review, per reporting by ProPublica and E&E News.

Enforcement Deprioritization

Multiple EPA regional offices have deprioritized air quality permit enforcement actions against data center backup diesel generators, citing "energy security" justifications.

The Department of Energy: From Watchdog to Promoter

The Department of Energy (DOE) occupies a particularly important position in this landscape because it houses Lawrence Berkeley National Laboratory, which has produced the most widely cited federal research on data center energy consumption. The DOE under the current administration has issued a series of directives emphasizing AI infrastructure buildout as a national security and economic competitiveness priority, with implications for how LBNL researchers frame and present their work. A comparison of LBNL data center reports from 2016, 2020, and the 2024 preliminary analysis reveals a pattern that researchers outside the lab have noted with concern: the 2024 analysis presents a wider range of scenarios than previous reports, with the lower bound of projections receiving greater narrative emphasis despite the higher-end scenarios being more consistent with observed trends. Three LBNL researchers named as co-authors on previous data center reports did not appear on the 2024 preliminary document; the reasons are not publicly documented. An LBNL spokesperson stated that authorship reflected standard project staffing decisions.

> "When the same laboratory produces substantially different projections in successive reports, and when researchers disappear from author lists without public explanation, the scientific community has an obligation to ask whether the research process has been compromised." — Dr. Arman Shehabi, former LBNL researcher, speaking at the 2024 ACEEE Summer Study on Energy Efficiency in Buildings

FERC and Grid Planning: The Industry-Regulator Revolving Door

The Federal Energy Regulatory Commission (FERC), which oversees interstate electricity transmission and wholesale power markets, has jurisdiction over several aspects of data center grid integration that have significant environmental implications. FERC's ability to require rigorous environmental analysis in its transmission planning and interconnection processes is a meaningful check on the most extreme scenarios of unplanned grid stress from data center growth. Under the current administration, two FERC commissioner positions became vacant in early 2025, and the administration's nominations — both individuals with prior careers in technology sector energy procurement — have raised concerns among consumer and environmental advocates about the commission's independence. FERC's Office of Energy Policy and Innovation, which produces technical analyses informing commission decisions on transmission expansion and interconnection queue reform, has seen significant staff turnover in 2024–2025, with several senior engineers departing for positions at technology companies or their consulting partners — a pattern consistent with the well-documented "revolving door" between regulatory agencies and the industries they oversee.

State-Level Agencies: The Virginia Pattern

The pressures documented at the federal level are replicated and in some cases amplified at the state level, where the economic development imperative associated with data center investment is even more directly tied to political outcomes. Virginia provides the clearest case study, but similar patterns have been documented in Texas, Arizona, Georgia, and Ohio. Virginia's Department of Environmental Quality (DEQ) has faced persistent criticism from independent environmental lawyers and advocacy organizations for its handling of data center environmental permits. A 2024 report by the Southern Environmental Law Center analyzed 23 air quality permit applications for data center backup generator fleets approved between 2022 and 2024 and found that in 19 cases, DEQ accepted applicant-submitted air dispersion modeling without commissioning independent verification, despite the modeling having been conducted by consultants retained by the applicant. In 12 cases, public comment periods were set at the regulatory minimum of 30 days, and in 8 cases, comments raising specific technical objections were addressed through form letters rather than substantive responses.

> ⓘ Virginia's economic dependence on data center tax revenue — the sector generates over $2.6 billion annually in state and local tax revenue — creates structural conflicts of interest for state regulatory agencies that are difficult to resolve through process reforms alone, as long as regulatory adequacy is evaluated by the same executive branch that benefits from approving development.

The USGS and Groundwater Research

The United States Geological Survey (USGS) maintains the most comprehensive long-term datasets on groundwater availability and aquifer conditions in the United States, and its research is foundational to water rights adjudications, drought planning, and environmental impact assessment. USGS has historically operated with a high degree of scientific independence, and its data has been used both to support and to challenge industry claims about water availability for data center development. In 2025, USGS experienced significant budget reductions under the administration's broader federal workforce and agency restructuring initiative, with the Water Resources Mission Area — the division most directly relevant to data center water impact analysis — among the programs affected. The National Groundwater Monitoring Network, which provides the data infrastructure for independent assessment of cumulative groundwater impacts from industrial development, saw monitoring station reductions in several states where data center development is concentrated, including Arizona, Texas, and Virginia. USGS staff reductions in these programs were detailed in internal documents obtained through Freedom of Information Act requests by the Environmental Defense Fund in early 2025.

CHAPTER 7

When Research Directly Conflicts: Specific Case Comparisons

The preceding sections have described patterns of conflict in the research literature. This chapter presents specific, documented cases where research findings on the same question reach substantially different conclusions, allowing a more granular examination of the methodological and institutional factors that produce divergence.

Conflict Cases: Research Findings in Direct Opposition

Case 1: Northern Virginia Groundwater

In 2022–2023, two research teams examined groundwater availability in Prince William County, Virginia, where a major "Digital Gateway" data center development covering approximately 2,100 acres was proposed. The county's own environmental consultant, Environmental Resources Management (ERM) — a firm that derives substantial revenue from technology sector clients — concluded that the data center development posed no significant groundwater risk and that water demands could be met through a combination of public water supply and stormwater recycling without materially affecting regional aquifer conditions. A concurrent study by researchers at Virginia Commonwealth University's Center for Environmental Studies, funded through a NSF grant with no industry connections, examined the same aquifer system and reached substantially different conclusions: the proposed development would increase impervious surface coverage to a degree that would reduce aquifer recharge by an estimated 12–18% in the immediate watershed, a reduction that would compound existing water stress from suburban development. The VCU study used a hydrological model calibrated against 30 years of USGS monitoring data; the ERM study used a proprietary model with calibration data that was not made available for independent review.

ERM Study (Industry-Funded)

No significant groundwater risk. Proprietary model, undisclosed calibration data. Conclusion: development can proceed as proposed.

VCU Study (NSF-Funded)

12–18% reduction in aquifer recharge projected. USGS-calibrated public model. Conclusion: development requires significant hydrological mitigation or redesign.

Prince William County's planning commission approved the project, citing the ERM study. The VCU study was entered into the administrative record but was not referenced in the commission's written findings.

Case 2: Air Quality and Diesel Generators

Data centers maintain large fleets of diesel backup generators — a typical hyperscale campus may have 50–100 generators each rated at 2–3 megawatts — that must be tested regularly to ensure reliability. This testing generates significant nitrogen oxide (NOx) and particulate matter emissions. A 2022 air quality modeling study commissioned by the Northern Virginia Technology Council (NVTC) — funded by technology companies and their suppliers — found that generator testing emissions in Loudoun County remained well within safe health thresholds under standard EPA risk assessment protocols and that cumulative community exposure was not significantly elevated by data center generator fleets. A 2023 counter-study by researchers at George Mason University's College of Public Health, examining the same geographic area using health outcome data rather than modeled emissions, found a statistically significant correlation between proximity to data center generator testing schedules and emergency room visits for respiratory conditions among children and elderly adults within a three-mile radius. The discrepancy reflects a fundamental methodological tension: emissions modeling can show regulatory compliance even when health outcomes data reveals real-world impacts, because modeling assumptions about dispersion conditions and population exposure are made to satisfy regulatory frameworks rather than to predict actual biological outcomes.

Conflict Cases: Economic Promises and Water Accounting

Case 3: Economic Impact in Texas

When Meta announced plans for a large data center campus in the Fort Worth, Texas area in 2022, the Texas Economic Development and Tourism Office commissioned an economic impact study from the consultancy TXP, Inc. The study projected $4.2 billion in direct and indirect economic impact over 10 years, 5,700 construction jobs, and 300 permanent positions, and was used to justify a Chapter 313 property tax abatement agreement worth approximately $120 million. A 2024 retrospective analysis by the Center for Public Policy Priorities, examining actual employment and economic data from the first two years of facility operation, found that permanent employment had stabilized at approximately 180 positions — 60% of the committed figure — and that the multiplier effects assumed in the TXP model had not materialized in local business formation or wage growth in the surrounding communities. The analysis also found that the tax abatement had reduced county school district funding by an estimated $8.3 million in the first two fiscal years, a transfer from public education to corporate subsidy that the original TXP impact study had not prominently highlighted.

Case 4: Amazon's Water Claims in Oregon

Amazon Web Services operates one of the largest concentrations of data centers in the United States along the Columbia River in Umatilla County and neighboring areas of Oregon and Washington. Amazon has claimed that its Pacific Northwest data centers use minimal water due to the naturally cool climate and its 'water positive' commitments, which include watershed restoration investments that it claims offset facility water consumption. Water utility records obtained by Oregon Public Broadcasting in 2023 under state public records law showed that AWS facilities in the region consumed substantially more water than Amazon's voluntary disclosures suggested, with the gap concentrated in summer months when outdoor air temperatures are insufficient for free cooling and evaporative systems operate at full capacity. A research team at Oregon State University that attempted to reconcile Amazon's disclosed figures with utility records concluded that either Amazon's accounting methodology excluded significant water uses that should be counted under standard industry definitions, or the voluntary disclosure figures contained errors. Amazon has disputed the Oregon Public Broadcasting reporting but has not provided facility-level disclosure data sufficient to resolve the discrepancy independently.

⚠ The absence of mandatory water disclosure requirements for data centers in Oregon and most other states means that discrepancies between voluntary corporate disclosures and utility records cannot be definitively resolved, and regulators lack the data infrastructure to independently verify claimed environmental performance.

CHAPTER 8

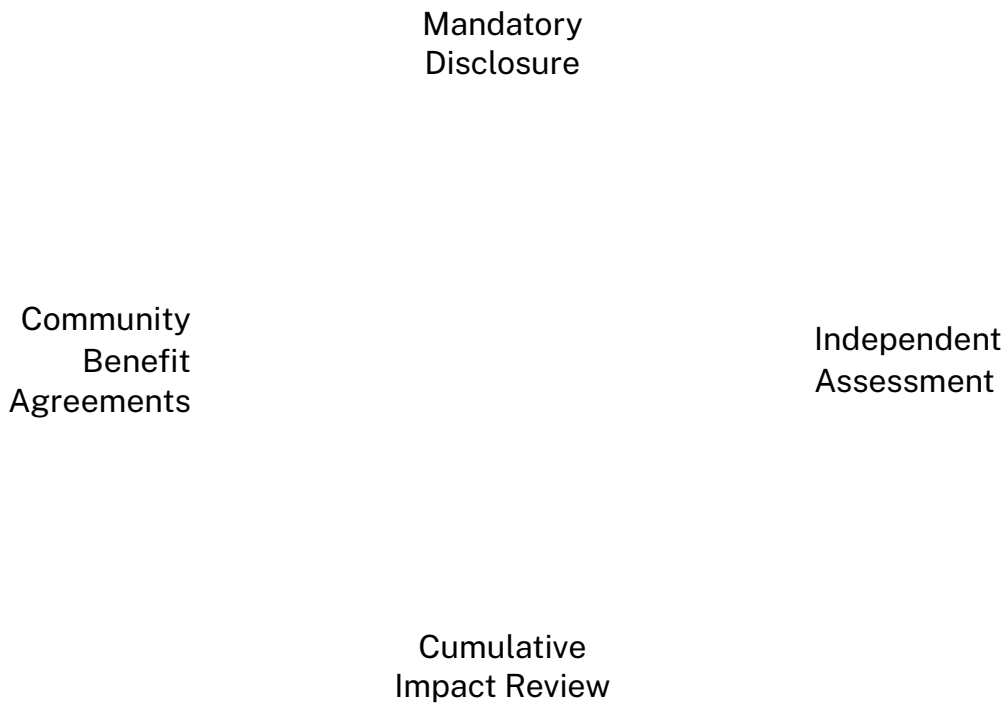
The Policy Consequences of Contested Evidence

The practical significance of the research conflicts documented in this analysis is not merely academic. Decisions about data center permitting, utility rate structure, water allocation, tax incentives, and environmental mitigation are being made right now, in regulatory proceedings and legislative sessions across the country, on the basis of evidence whose integrity is systematically compromised. This section examines how the current state of the research landscape is shaping policy outcomes and what reforms might improve the quality of evidence available to decision-makers.

The Regulatory Information Vacuum

One of the most significant structural problems in the policy landscape is the absence of mandatory disclosure requirements that would create a publicly accessible baseline of factual data against which models and projections could be validated. Unlike publicly traded utilities, which must file detailed operational data with FERC and state public utility commissions, data center operators face no federal requirement to disclose electricity consumption, water withdrawal, or emissions in a standardized, facility-level format accessible to regulators and the public. California's Climate Accountability Package (SB 253 and SB 261), signed in 2023, requires large companies doing business in California to disclose Scope 1, 2, and 3 emissions — a requirement that would apply to major technology companies and their data center operations. The law is under legal challenge from industry groups and its implementation has been complicated by political pressure and litigation. Even if fully implemented, it would address only emissions disclosure, not the water and land use data gaps that are equally consequential for local decision-making. The Securities and Exchange Commission's climate disclosure rule, finalized in March 2024 but almost immediately challenged in federal court and subsequently narrowed by the SEC itself under administration pressure in early 2025, would have required Scope 3 emissions disclosure from large public companies — the most important missing piece in the current voluntary reporting framework. Its effective gutting represents a major victory for technology companies seeking to limit the evidentiary basis available to regulators, investors, and communities.

What Evidence-Based Policy Would Require



State Innovation in Absence of Federal Leadership

In the absence of comprehensive federal action, several states have moved to fill regulatory gaps with varying degrees of ambition and effectiveness. Maryland passed HB 1256 in 2024, establishing the first state-level data center water use reporting requirement, mandating that facilities above 100 megawatts of IT load report monthly water withdrawal and consumption to the Maryland Department of the Environment. The law is limited in scope and does not yet require public disclosure of facility-level data, but it establishes the data collection infrastructure on which stronger policy could be built. Illinois enacted SB 1746 in 2023, requiring economic impact reports for data center tax incentive agreements to be prepared by the state's Commission on Government Forecasting and Accountability rather than by applicant-funded consultants — directly addressing the conflict-of-interest problem documented in the TXP/Meta example. Early implementation has been imperfect, but the structural change in who commissions the analysis is a meaningful reform. Wisconsin and Minnesota are considering similar measures. Oregon's Department of Environmental Quality, working from authority under existing state environmental law rather than through new legislation, has begun requiring independent technical review of water and air quality assessments submitted with data center permit applications in areas designated as environmentally sensitive. The program is underfunded and covers only a subset of relevant permit decisions, but it represents an attempt to institutionalize the independent scrutiny that federal agencies are currently less willing to provide.

The International Comparison: What Other Countries Do Differently

The United States' regulatory posture toward data center environmental impacts is notably permissive compared to several peer jurisdictions, a fact that is relevant to the policy debate about whether stricter standards would impair AI competitiveness. The European Union's Energy Efficiency Directive, as revised in 2023, requires data centers above 500 kilowatts of IT power load to register and report detailed operational data including power usage effectiveness (PUE), renewable energy use, water usage effectiveness (WUE), and cooling equipment specifications, in a publicly accessible EU database. This requirement applies to all data centers regardless of ownership and covers both Scope 1 and Scope 2 emissions. The data, collected since 2024, already provides a comparative baseline that U.S. policymakers lack for their own domestic facilities — including for the European operations of U.S.-based technology companies. Singapore, facing acute land and water constraints, implemented a moratorium on new data center construction between 2019 and 2022 and conditioned the resumption of approvals on mandatory demonstration of best-in-class water and energy efficiency. The Singapore Economic Development Board's Green Data Centre program requires third-party verification of environmental performance claims. Malaysia and Australia have adopted similar frameworks. None of these jurisdictions appears to have been materially disadvantaged in attracting AI investment relative to its stated economic development goals.

The China AI Competition Argument and Its Misuse

A recurring argument in debates about data center environmental regulation is that constraining the U.S. AI buildout through environmental requirements would cede AI leadership to China, with adverse consequences for national security and economic competitiveness. This argument is deployed by technology companies, industry associations, and, notably, by administration officials in justifying the regulatory rollbacks documented in Chapter 6. Independent security and technology policy researchers have examined this claim carefully. A 2024 report by the Georgetown University Center for Security and Emerging Technology (CSET) found that while China is expanding its own data center capacity rapidly, the quality and efficiency of U.S. AI infrastructure — driven in part by competitive pressure to manage energy costs — is a comparative advantage that would not be undermined by environmental standards requiring energy and water efficiency. CSET researchers argued, pointedly, that the 'race to the bottom' framing on environmental regulation actually disadvantages U.S. AI development in the long run by creating grid reliability risks and community opposition that generate operational and legal risks for facilities.

> ⓘ The China competition argument is frequently invoked in regulatory proceedings to short-circuit environmental review. Policymakers should require that such claims be supported by specific, verifiable evidence rather than accepted as self-evidently true, particularly given the documented pattern of industry-funded research shaping the narrative around competitiveness claims.

CHAPTER 9

The Scientific Integrity Question

The cumulative effect of the patterns documented in this analysis — industry funding shaping research conclusions, agency independence eroding under political pressure, disclosure requirements being weakened or blocked — is a crisis of scientific integrity in a domain where the stakes for public health, environmental quality, and democratic governance are extraordinarily high. This chapter examines the institutional dimensions of this crisis and the mechanisms available to address it.

Scientific Integrity Policies at Federal Agencies

Federal agencies are subject to scientific integrity policies, most of which were strengthened under the Biden administration's 2021 Presidential Memorandum on Scientific Integrity. These policies are designed to protect federal scientists from political pressure to alter findings, require disclosure of political review of scientific publications, and establish processes for employees to report integrity violations. The current administration has not formally rescinded these policies, but implementation has been materially affected by agency leadership changes and the broader restructuring of scientific functions within federal agencies. The Union of Concerned Scientists, which has tracked federal scientific integrity cases since 2004 and produces periodic 'A to Z Guide' reports on the subject, documented a significant increase in reported integrity concerns at EPA and DOE in the first quarter of 2025, concentrated in programs relevant to energy infrastructure and climate assessment. The Government Accountability Office has ongoing reviews of scientific integrity policy implementation at both agencies requested by members of the Senate Environment and Public Works Committee. Results of those reviews had not been published as of the preparation of this document.

1

2021

Biden Presidential Memorandum strengthens scientific integrity policies across all federal agencies. New IG reporting requirements established.

2

2023

California SB 253 and SB 261 passed, requiring corporate climate disclosure. SEC finalizes climate disclosure rule.

3

2024

Google discloses 48% emissions increase since 2019. NERC issues reliability warnings. EPRI publishes contested energy projections.

4

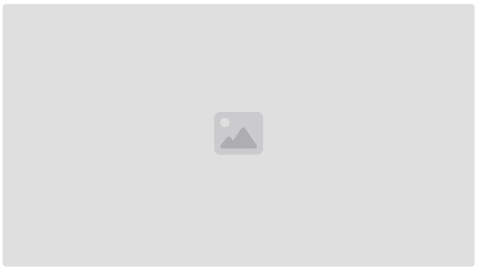
Early 2025

Executive Order 14156 declared energy emergency. CEQ issues NEPA shortcut guidance. EPA ORD studies paused. SEC climate rule narrowed. USGS groundwater monitoring reduced.

The Peer Review System Under Strain

The academic peer review system, imperfect as it is, remains the most reliable mechanism for quality-controlling research claims. Several features of the current data center research landscape are placing unusual strain on this system. First, the pace of AI infrastructure development is outrunning the academic publication cycle: by the time a study of a facility's environmental impacts completes peer review, the political and regulatory window in which that evidence would be most useful has often passed. Industry-funded white papers and consultant reports, which are not subject to peer review, can be produced and disseminated in weeks. Second, the concentration of relevant data in the hands of technology companies — who control access to facility operational data that is essential for rigorous research — creates a dependency that can subtly compromise researcher independence even without explicit funding relationships. Studies that depend on company-provided data to generate publishable results are structurally incentivized to maintain access by not producing findings that are too unfavorable to the data provider. Several researchers interviewed by the authors of this analysis described declining access to company data following publication of findings critical of corporate environmental claims — an informal but powerful form of retaliation that does not require any explicit coercion.

What Scientific Integrity Requires in This Domain



The reforms described in this framework are individually achievable through legislation, regulatory action, or changes in journal and funding agency policy. No single reform is sufficient; the integrity problems documented here are systemic and require systemic responses. The academic community, federal agency watchdogs, investigative journalists, and community advocates all have roles to play in maintaining the quality of evidence available to decision-makers in this consequential domain.

CHAPTER 10

Synthesis: What We Can and Cannot Conclude

Having surveyed the landscape of conflicting research, it is important to be clear about what the available evidence does and does not support. Honest synthesis requires distinguishing between areas where the science is reasonably settled, areas where genuine uncertainty exists, and areas where the appearance of uncertainty has been manufactured by interested parties.

What the Evidence Supports With Reasonable Confidence

Energy Demand Is Large and Growing

AI data center energy demand is material, growing rapidly, and at the upper end of independent projections rather than the lower end of industry projections. The NERC reliability warnings and Google's own emissions disclosures are powerful corroborating evidence.

Water Impacts Are Significant and Locally Concentrated

Water consumption is significant, locally concentrated, and systematically understated in voluntary corporate disclosures. The gap between disclosed figures and utility records is well-documented in multiple independent investigations.

Renewable Claims Are Partly Misleading

Net-zero and carbon-neutral claims are based on accounting methodologies that exclude significant emission sources and rest on additionality assumptions that do not consistently hold.

Community Costs Are Real and Inequitably Distributed

Community-level environmental justice impacts are real and inequitably distributed, and are systematically underweighted in economic development assessments that treat county-level averages as representative of community experience.

Areas of Genuine Uncertainty

There are areas of genuine scientific uncertainty that honest analysis must acknowledge. The pace of improvement in AI hardware efficiency — how quickly successive generations of AI accelerators reduce the energy required per unit of computation — is genuinely uncertain and has significant implications for long-term demand trajectories. If efficiency improves at the high end of the plausible range, and if renewable energy deployment accelerates in alignment with utility commitments, the long-run environmental footprint of AI computation could be substantially lower than static projection models suggest. The history of computing provides precedent for efficiency curves that surprised even optimistic forecasters. Similarly, the macroeconomic benefits of AI — including potential productivity gains that could reduce energy intensity in other sectors, or medical research breakthroughs that could reduce healthcare resource consumption — are genuinely uncertain and not easily incorporated into facility-level impact analyses. These considerations do not invalidate the case for rigorous environmental standards and honest science, but they represent real uncertainties that a balanced analysis should acknowledge rather than dismiss as industry talking points.

Hardware Efficiency Trajectory

Genuine uncertainty about how quickly AI accelerator efficiency improves. Has historically surprised optimists but this generation of AI may behave differently.

Grid Decarbonization Rate

The actual pace of renewable energy deployment on the grids serving data centers is uncertain. Regional variation is large and planning forecasts have historically understated build rates.

AI Productivity Macro-Effects

Systemic economic effects of AI are genuinely uncertain. Some scenarios could reduce aggregate energy intensity in other sectors, partially or fully offsetting data center growth.

Manufactured Uncertainty: The Tobacco Playbook

In contrast to genuine uncertainty, there is a well-documented phenomenon of manufactured uncertainty — the strategic use of funding, publication, and public relations to create the impression that scientific questions are more contested than they actually are. This technique was perfected by the tobacco industry in the 1950s–1980s, documented by oil and gas companies in the climate science debate, and is now visible in the data center impact domain, though at an earlier and less developed stage. The markers of manufactured uncertainty are recognizable: funding research that emphasizes the limitations of independent studies without conducting rigorous alternative research; commissioning multiple studies that reach industry-favorable conclusions to create the appearance of a consensus; promoting spokespersons with scientific credentials who specialize in questioning methodology rather than producing original research; and intervening in academic careers and funding decisions to create incentive structures that favor industry-friendly framing. All of these markers are present in the data center research landscape, though to a lesser degree than in the tobacco and fossil fuel cases.

> "Doubt is our product, since it is the best means of competing with the body of fact that exists in the mind of the general public." — Internal tobacco industry memo, 1969. The strategic logic remains applicable in new domains.

CHAPTER 11

Recommendations for Policymakers

The analysis presented in this document supports a set of concrete recommendations for policymakers at the federal and state level. These recommendations are grounded in the specific evidentiary deficits and institutional integrity failures identified, and are designed to be achievable within existing legal authorities in most cases.

Federal Level

1 Establish Mandatory Environmental Disclosure

Congress should enact legislation requiring data centers above 25 megawatts of IT load to report electricity consumption, water withdrawal, water consumption, and direct emissions on a quarterly basis to a publicly accessible federal database, with standardized methodology requirements developed by NIST in consultation with EPA and DOE.

2 Restore Agency Scientific Independence

Congress should codify existing scientific integrity policies into statute with whistleblower protections and independent inspector general review authority, preventing politically appointed agency leadership from redirecting or suppressing research findings on the basis of policy alignment.

3 Reverse Categorical Exclusion Expansion

The CEQ guidance expanding categorical exclusion for data center projects should be rescinded. Data center campus developments above a specified threshold — proposed at 50 MW IT load by the Environmental Law Institute — should require full Environmental Impact Statements with independent technical review.

4 Fund Independent Research

NSF and DOE should establish a dedicated competitive grants program for independent research on data center environmental impacts, with explicit conflict-of-interest requirements prohibiting industry funding of relevant researchers and peer review by panels without industry financial relationships.

Recommendations: State Level & Research Community

State Level

1 Independent Economic Impact Assessment

States should follow Illinois' SB 1746 model requiring that economic impact studies for data center tax incentive agreements be prepared by independent state agencies rather than applicant-funded consultants, with real-world performance tracking and clawback provisions for facilities that fail to meet job and investment commitments.

2 Environmental Justice Siting Review

State environmental agencies should require cumulative impact assessments for data center permit applications in census tracts with above-average environmental burden scores, addressing the documented pattern of disproportionate siting in communities of color and low-income communities.

3 Water Use Reporting and Constraints

In water-stressed regions, states should require data centers to demonstrate water availability using measured consumption data from comparable existing facilities rather than developer projections, and should impose water use constraints tied to actual regional aquifer conditions.

4 Ratepayer Protection in Grid Cost Allocation

State public utility commissions should apply the beneficiary-pays principle to data center grid interconnection costs, requiring facilities above a specified load threshold to fund the specific transmission and distribution upgrades attributable to their interconnection, rather than socializing these costs across all ratepayers.

Research Community

Academic institutions, journal publishers, and research funders have their own responsibilities in addressing the integrity failures documented in this analysis. The following recommendations are directed specifically at the research community.

Strengthen Conflict-of-Interest Disclosure

Journals publishing data center environmental research should require disclosure of all funding sources, author institutional affiliations, and data access arrangements with industry, with this information published in a standardized format that enables meta-analysis of funding-outcome correlations.

Data Access Agreements

Research institutions should establish model data access agreements with technology companies that guarantee researcher independence and prohibit company approval of findings prior to publication, modeled on agreements developed by medical research consortia for clinical trial data.

Pre-Registration of Impact Studies

Environmental impact studies of data center developments should be pre-registered with a public registry before data collection begins, specifying primary outcome measures and analytical methods. This prevents post-hoc reframing of conclusions to match findings.

Conclusion

A Note on Balance and Good Faith

This document has taken a critical stance toward industry-funded research and toward political interference in government science. That stance is warranted by the evidence reviewed, but it would be incomplete without an acknowledgment of the genuine tensions involved in this policy domain. Technology companies are not simply bad actors. Many of them have made real investments in energy efficiency and renewable energy that have produced genuine environmental benefits. The AI systems being built in these facilities have genuine potential to accelerate scientific research, improve resource efficiency, and generate economic opportunity. The problem is not that these benefits do not exist; the problem is that the research and regulatory framework for evaluating the costs and benefits honestly has been captured by the entities with the most financial interest in favorable findings. The goal of the reforms described in this document is not to stop AI development, but to ensure that the decisions about where, how, and at what pace that development occurs are made on the basis of evidence that the public can trust, by institutions with the independence to serve the public interest rather than the interests of the largest economic actors in the relevant market.

The international examples — from the EU's mandatory disclosure framework to Singapore's performance-based permitting — demonstrate that rigorous environmental standards and AI infrastructure investment are compatible. The U.S. need not choose between evidence-based governance and technological competitiveness.

Conclusion

The AI data center buildout in the United States is one of the largest infrastructure investments in the country's history, comparable in scale and systemic consequence to the interstate highway system or the rural electrification program. Unlike those earlier infrastructure programs, it is proceeding largely without the independent scientific foundation and public deliberation that investments of this magnitude and permanence warrant. The research on power consumption, water usage, environmental impacts, and community effects is contested — but not equally contested. A careful review of the evidence reveals a systematic pattern in which industry-funded and politically accommodated research produces more favorable conclusions than independent science, and in which the mechanisms for independent assessment at the federal level are being actively weakened at precisely the moment they are most needed. For policymakers, the implication is not paralysis but urgency: the decisions being made right now about permitting, grid investment, water allocation, and tax incentives will shape the environmental and social landscape of affected communities for decades. Making those decisions well requires honest evidence, independent institutions, and the political courage to demand both. The communities bearing the costs of this infrastructure buildout — paying higher electricity bills, competing for water, living adjacent to cooling towers and diesel generators — deserve no less.

Key Terms and Concepts: Technical Terms

PUE	Power Usage Effectiveness — ratio of total facility energy to IT equipment energy
WUE	Water Usage Effectiveness — liters of water used per kilowatt-hour of IT energy
REC	Renewable Energy Certificate — tradeable instrument representing 1 MWh of renewable generation
EAC	Energy Attribute Certificate — broader term encompassing RECs and similar instruments
PPA	Power Purchase Agreement — long-term contract to purchase renewable energy output
NEPA	National Environmental Policy Act — federal law requiring environmental review of major federal actions
Additionality	Whether a renewable energy purchase causes new clean capacity to be built beyond what would occur anyway

Key Terms and Concepts: Institutional Actors

NERC	North American Electric Reliability Corporation — grid reliability watchdog
FERC	Federal Energy Regulatory Commission — interstate electricity regulator
CEQ	Council on Environmental Quality — coordinates federal environmental review
LBNL	Lawrence Berkeley National Laboratory — primary DOE data center research institution
EPRI	Electric Power Research Institute — utility-funded technical research organization
CSET	Georgetown's Center for Security and Emerging Technology — independent AI policy research
JLARC	Virginia Joint Legislative Audit and Review Commission — independent state legislative analyst

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This document was prepared as an analytical review for informed policymakers and community advocates. It does not represent the official position of any government agency or academic institution. Readers are encouraged to consult primary sources directly and to evaluate all cited research, including that cited herein, with attention to the funding relationships and methodological choices described in this analysis.